Project Title:
The Community-based Whole Magnetosphere Model

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Project Information:
We propose to build a Community-based Whole Magnetosphere Model (CWMM). This model will be comprised of seven phyiscs domains: global magnetosphere, inner magnetosphere drift physics, radiation belts, plasmasphere, polar wind, ionospheric electrodynamics, and upper atmosphere and ionosphere. The models will be self- consistently coupled together with the only drivers being the solar wind and interplanetary magnetic field, the solar EUV, and the forcing from the mesosphere. The different domains will be coupled together using the Space Weather Modeling Framework (SWMF). The CWMM will be released to the Community Coordinated Modeling Center (CCMC) and the source code and all documentation will be made publically available. At present, we have coupled together five of these domains and have proven that they can be driven as a self-consistent system using only upstream solar wind, IMF, and solar EUV conditions. We have shown that this coupled model handles some of the strongest storms ever experienced (e.g. the October 29-30, 2003 storm), reproduces data in the thermosphere, ionosphere, and magnetosphere. The current version of the SWMF is under evaluation at the CCMC and limited runs on request are being offered. We propose to create the CWMM by including more models of the geospace region, and by concentrating on the rigorous validation of the coupled system of models. The CWMM will consist of 15 community created models of the magnetosphere, ionosphere, and thermosphere and will be made available back to the community for their use through runs on request from the CCMC and source code from the University of Michigan. Many of the models that will be included in the CWMM have been individually validated, but it is our goal to validated the coupled model as a whole, and quantify the improvement in the performace as more physics-specific models are included. This will be done through the use of community established metrics such as drift-meter measurements, total electron content measurements, and radiation belt fluxes. The CWMM will have the ability to both assimilate data within the ionosphere and magnetosphere, and output results at precise satellite measurement locations for rapid assessment of model quality. These features will be made available to the general community through a real-time operational model interface at the University of Michigan.

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